The Mesoscale Ocean Contribution to Sea Surface Temperature Distribution

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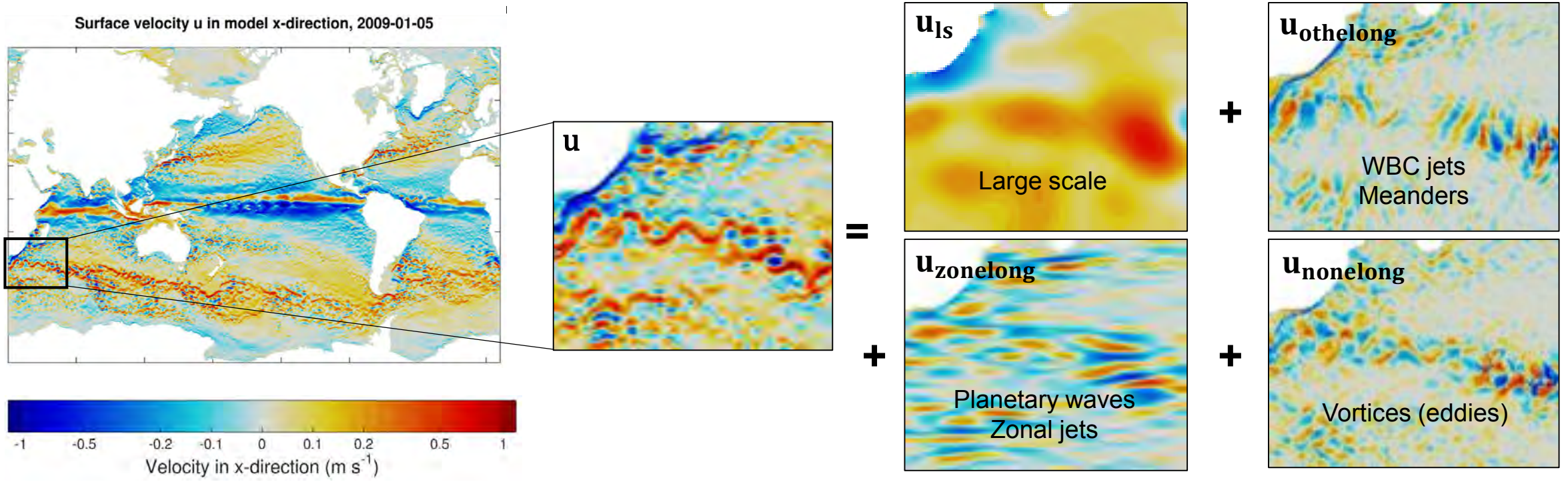
What are we doing?

- Developing a framework by which the contributions of different types of mesoscale dynamics to surface variability can be quantified, focusing on the mixed layer temperature budget (i.e. SST variability)

Temperature Budget

$$\frac{\partial T}{\partial t} = -\nabla \cdot \mathbf{u}T - \nabla_h^2\left(A_h \nabla_h^2 T\right) + \frac{\partial}{\partial z}\kappa\left(\frac{\partial T}{\partial z} - \Gamma\right) + \frac{1}{\rho C_\rho} Q_{\text{net}}$$

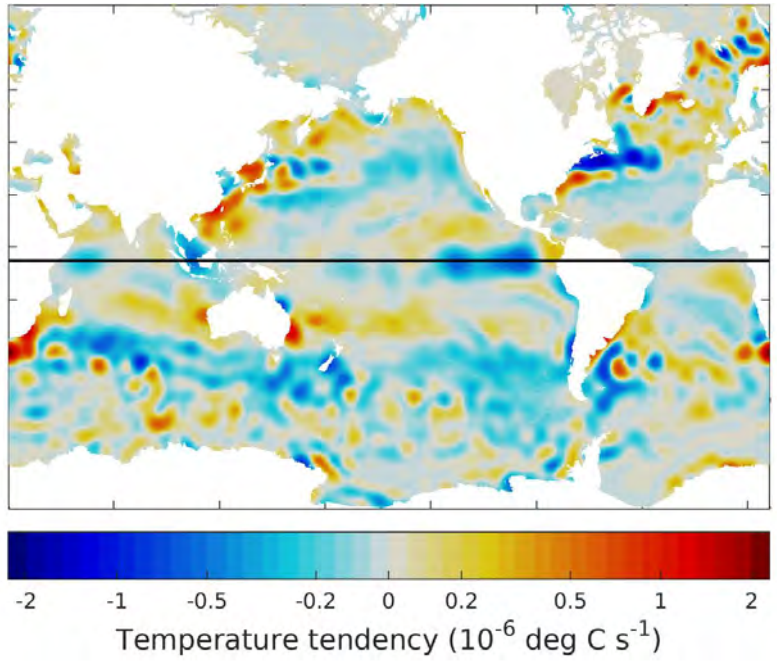
Decompose advection term **u** (3D velocity) and *T* (temperature) using two-dimensional spectral filters, in 0.1° forced ocean CESM simulation.



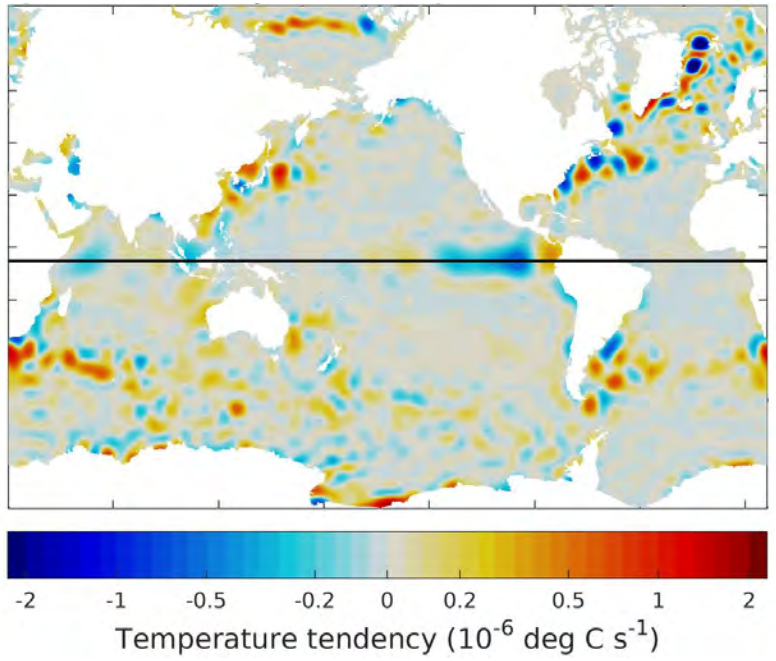
What is the effect of the mesoscale on temperature tendency?

- These are for a 5-day mean (2009 Jan 1-5). Low-pass spatial filter also applied after tendency computation to smooth patterns

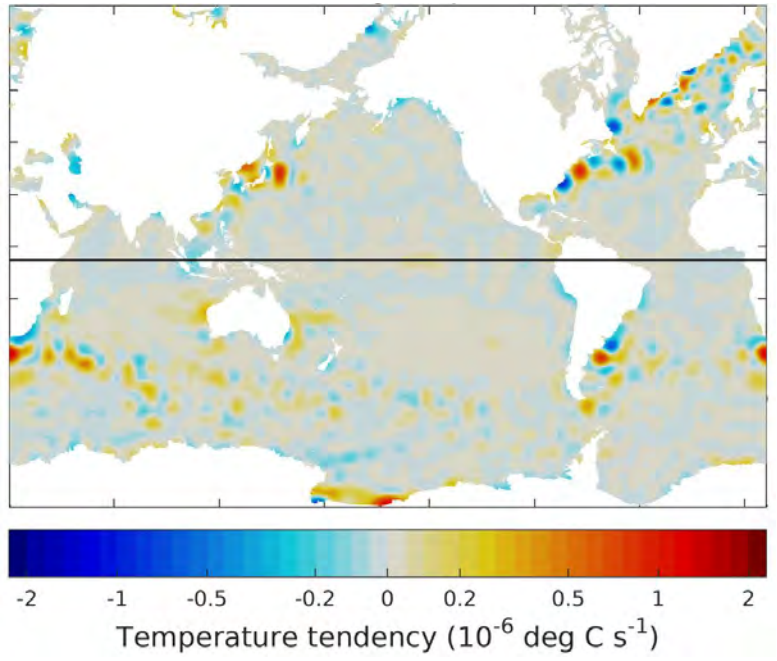
Temperature tendency – all advection



Excluding large-scale term



Only terms with "eddy" component



Work in progress/planned

- Extend this analysis to quantify seasonal/interannual/decadal timescale contributions of mesoscale ocean dynamics to SST
- Adapt budget and filtering code for use with Arakawa C-grid models (e.g., MITgcm)
- Thanks to NASA Physical Oceanography for support, and Ben Johnson and Frank Bryan for running the model simulation and assisting with obtaining output.

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